# NEW BEDFORD AQUATIC DISPOSAL SITE SCREENING

# CHARACTERIZATION OF THE NEW ZONE OF SITING FEASIBILITY AND WEST ISLAND LEDGE SITES

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January 2000

Massachusetts Coastal Zone Management Office
Dredged Material Management Plan
Phase 2C Program

SAIC Project No. 01-0440-04-4391-600
SAIC Report No. 481

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## 1.0 BACKGROUND

As part of the Massachusetts Coastal Zone Management Office's (MCZM) Dredged Material Management Plan (DMMP), aquatic disposal site screening has been conducted for New Bedford Harbor based on a Zone of Siting Feasibility (ZSF) extending from Clarks Point to Wilbur Point (original ZSF boundary in Figure 1). After discussions with the Federal agencies, a revised ZSF was formulated (Figure 1), resulting in an area of the seafloor that has not been through the formal siting process. This area is referred to herein as the Outer Channel Area. Use of the historical West Island Ledge disposal site (Figure 1) also has been suggested as a disposal alternative. Although this site is outside the modified ZSF, it also needs to be evaluated through the screening process.

This report presents information on the physical characteristics of both the Outer Channel Area and the historical West Island Ledge disposal site and provides recommendations regarding the feasibility of locating new candidate disposal sites in these areas. Both historic and recent data sources were consulted to provide information on the following physical characteristics: bathymetry, sediment grain size, benthic habitat types, and sub-bottom characteristics (i.e., depth to bedrock).

## 2.0 RESULTS AND DISCUSSION

### 2.1 West Island Ledge

The historical West Island Ledge disposal site is located due south of West Island and east of West Island Ledge (Figures 1 and 2). This site also has been referred to as the Fairhaven Disposal Site. Presumably, this site was used in the past for disposal of dredged material from New Bedford and Fairhaven, but an extensive literature search failed to find any existing data or reports providing information about when this site was utilized or the nature of the disposed material.

Based on a review of NOAA nautical chart No. 13230, depths at the former disposal site range from 12 to 30 ft, with most of the area occurring in about 20 to 30 ft of water (Figure 2). Bottom topography in this area appears to be variable, comprised of a series of rock ledges. The NOAA chart indicates that hard and/or rocky bottom types surround the spoil area (Figure 2).

In an early study of bottom sediments in Buzzards Bay, Moore (1963) generally found that the deeper part of the bay and depressions near the shore are covered with fine-grained sediments (mud), while sands and gravels cover the shallower nearshore areas most exposed to waves and tidal currents (Figure 3). Moore's map shows that sediments in the vicinity of the West Island Ledge disposal site consist of a mixture of gravel and fine to medium sand (Figure 3). Based on more extensive sampling which included the southern boundary of the West Island Ledge disposal site, Summerhayes et al. (1977;

1985) confirmed that sediments in this area consist of gravel and muddy sand (Figure 4). Sediment samples from within the disposal site were comprised of less than 10% silt-clay (Figure 5).

Based on the available information showing the presence of hard rock ledges and the predominance of coarse-grained sediments in and around the former West Island Ledge disposal site, it appears that this is an erosional rather than depositional area. The site is exposed to the open waters of Buzzards Bay and is marginal with respect to the minimum preferred depth (20 ft) for potential aquatic disposal sites being considered under the DMMP. Based on its physical characteristics, the site does not appear to be capable of passing the initial feasibility screen as a viable aquatic alternative.

## 2.2 Outer Channel Area

Depths in the Outer Channel Area generally range from 10 to 34 ft. (Figure 6). East of the dredged shipping channel, the bottom topography is relatively variable and is comprised of several named rocks and ledges (e.g., Henrietta Rock, Packet Rock; Figure 6). The area in the immediate vicinity of North Ledge also has variable topography, with depths ranging from 9 to 22 feet. A broad area of relatively flat bottom occurs west of the shipping channel and extends to the boundary of the ZSF. Depths across this area vary between 20 and 30 feet (Figure 6).

Based on extensive sediment grab and core sampling at 116 stations located throughout Outer New Bedford Harbor and its approaches, Summerhayes et al. (1977; 1985) constructed detailed maps of sediment grain size. In the Outer Channel Area, sediments were found to include mixtures of gravel, sand and mud in various proportions. The highest proportion of fine-grained sediment (>75% silt-clay) was found within the shipping channel, while the area immediately west of the shipping channel had somewhat lower proportions of silt-clay (50% to 75%; Figure 7). Outside of these areas, sediments generally were characterized by less than 50% silt-clay. REMOTS® sediment-profile images obtained in November 1998 at station 139 showed fine-grained sediments occurring within the outer shipping channel.

Sediment grain size results from grab samples obtained in 1993 by Nelson et al. (1996) also are shown in Figure 7. The five samples obtained within the Outer Channel Area tend to agree with the Summerhayes et al. results: relatively high proportions of silt-clay were found in the samples near and immediately to the west of the navigation channel, while elsewhere there was significantly less silt-clay.

Subbottom profiling results presented in Summerhayes et al. (1977; 1985) indicate that depths to bedrock within the Outer Channel Area are either in the range 8 to 25 ft. or greater than 25 ft. (Figure 8). The greatest subbottom capacity (depth to bedrock >25 ft) was at and west of the outer section of the shipping channel, as well as within the triangular area bounded by Clarks Point, Bents Ledge and North Ledge (Figure 8).

Overall, the results indicate that with the exception of the shipping channel itself, there are no locations within the Outer Channel Area ZSF that appear to be strongly depositional. The broad, relatively flat area immediately to the west of the shipping channel is characterized by sediments with a significant fine-grained fraction (50% to 75% silt-clay), suggesting moderate depositional potential. However, it is important to note that the sediment grain size results in this area may be confounded by the sewage outfall at Clarks Point, which may contribute some proportion of these fines.

The area west of the navigation channel was selected as a potential location for an open-water Confined Aquatic Disposal (CAD) site, called the Clarks Point CAD (Figure 9). Designation of this CAD site is based on the surface sediment grain size results, which suggest this area is moderately depositional, as well as on the sub-bottom results indicating ample sub-bottom capacity (depth to bedrock >25 ft). The configuration of the potential CAD cell is based on both the distribution of fine-grained surface sediments (Figure 10) and maximum sub-bottom capacity (Figure 11). This potential CAD cell comprises an area measuring 963,515 $m^2$ (238 acres). Assuming a depth to bedrock of at least 30 ft, this area has a potential capacity of over 11 million cubic yards.

Measurements of the near-bottom hydrodynamic regime (waves and currents) would be needed to assess with greater confidence the containment versus erosional potential of this candidate open-water CAD site. It should also be noted that in the initial aquatic disposal site alternative analysis (Task I of DMMP Phase 1), potential CAD sites in this general area (e.g., at Bents Ledge and Great Ledge) were found to have significant shell fishing, lobstering, commercial and recreational finfishing. The presence of such resources may limit the future viability of the potential Clarks Point CAD site as the screening process proceeds.

The Clarks Point CAD site has been added to the list of candidate sites currently under consideration for New Bedford. Relevant information regarding the physical and biological characteristics of this site has been added to the Siting Database, as shown in Appendix A.

## 3.0 CONCLUSIONS AND RECOMMENDATIONS

1) The area in and around the historic West Island Ledge disposal site is characterized by the presence of hard rock ledges and coarse-grained sediments. Based on these physical characteristics, this site appears to be erosional rather than depositional.

2) The historic West Island Ledge disposal site is exposed to the open waters of Buzzards Bay and is marginal with respect to the minimum preferred depth of 20 ft for potential aquatic disposal sites being considered under the DMMP.

3) Based on its physical characteristics indicating erosion potential, the site did not pass the initial feasibility screen as a potential aquatic disposal alternative.

4) Surface sediments in the Outer Channel Area consisted of various mixtures of gravel, sand, and silt-clay. A broad, relatively flat area to the west of the navigation channel had a relatively high proportion of fine-grained sediment (>50% silt-clay) and was considered moderately depositional.

5) The area west of the navigation channel also had relatively high sub-bottom capacity (>25 ft). Based on the evidence suggesting minimal erosion potential and sufficient capacity, it was recommended that a candidate open-water Confined Aquatic Disposal (CAD) site be considered in this area. The site is called the Clarks Point CAD site.

6) The Clarks Point CAD cell was found to have a potential capacity of over 11 million $yd^3$. Measurements of the near-bottom hydrodynamic regime would be needed to assess more confidently the erosion potential of the site. Significant fish and shellfish resources located in the vicinity of this site may limit its future viability in the screening process.

## 4.0 REFERENCES


Moore, J. R. 1963. Bottom sediment studies, Buzzards Bay, Massachusetts. Journal of Sedimentary Petrology 33: 511-558.

Nelson, W. G., B. J. Bergen, S. J. Benyi, G. Morrison, R. A. Voyer, C. J. Strobel, S. Rego, G. Thursby and C. E. Pesch. 1996. New Bedford Harbor Long-Term Monitoring Assessment Report: Baseline Sampling. U.S. Environmental Protection Agency, National Health and Environmental Effects Research Laboratory, Atlantic Ecology Division, Narragansett, RI. EPA/600/R-96/097.

Summerhayes, C. P., J. P. Ellis and P. Stoffers. 1985. Estuaries as sinks for sediment and industrial waste – a case history from the Massachusetts coast. In: Fuchtbauer et al. [Eds.] *Contributions to Sedimentology* No. 14. E. Schweizerbart'sche Verlagsbuchhandlung (Nagele u. Obermiller), Stuttgart, Germany, 47 pp.

Summerhayes, C. P., J. P. Ellis, P. Stoffers, S. R. Briggs and M. G. Fitzgerald. 1977. Fine-grained sediment and industrial waste distribution and dispersal in New Bedford Harbor and western Buzzards Bay, Massachusetts. Woods Hole Oceanographic Institution Technical Report WHOI-76-115, 110 pp.

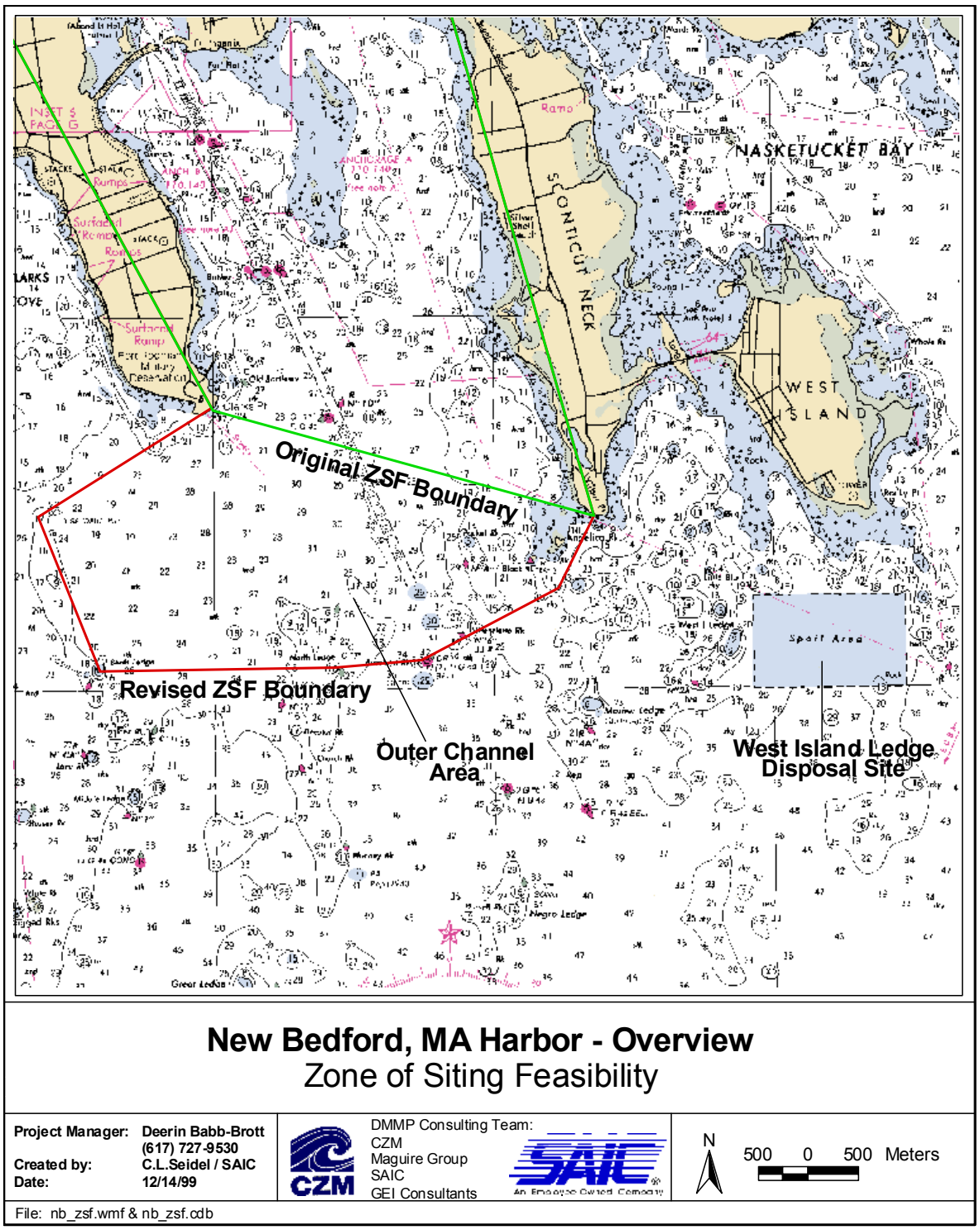


**Figure 1.** Map of outer New Bedford Harbor showing the locations of the Outer Channel Area and the historic West Island Ledge disposal site.

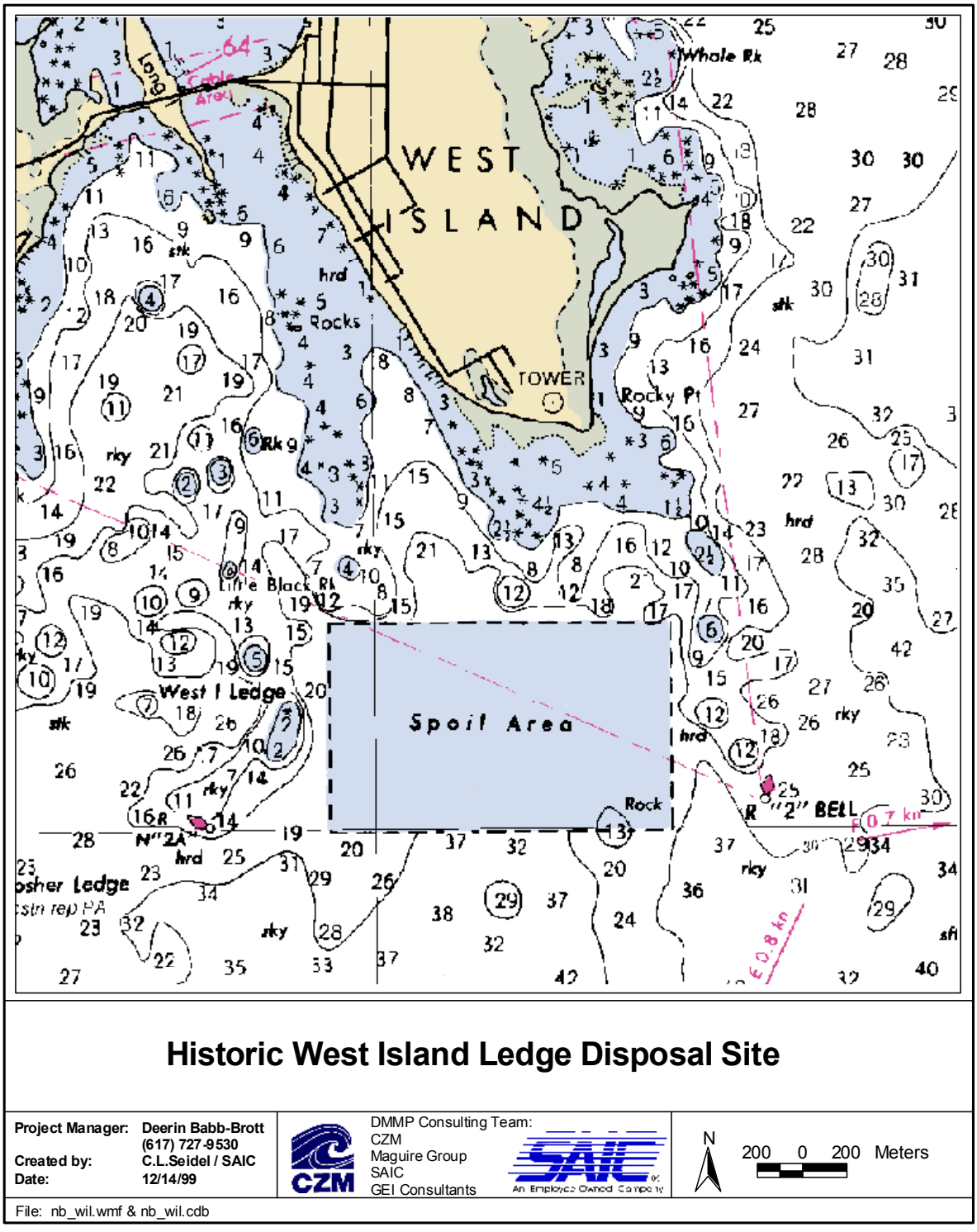


**Figure 2.** Map showing depth (in feet) and bottom topography in the vicinity of the historic West Island Ledge disposal site ("Spoil Area").

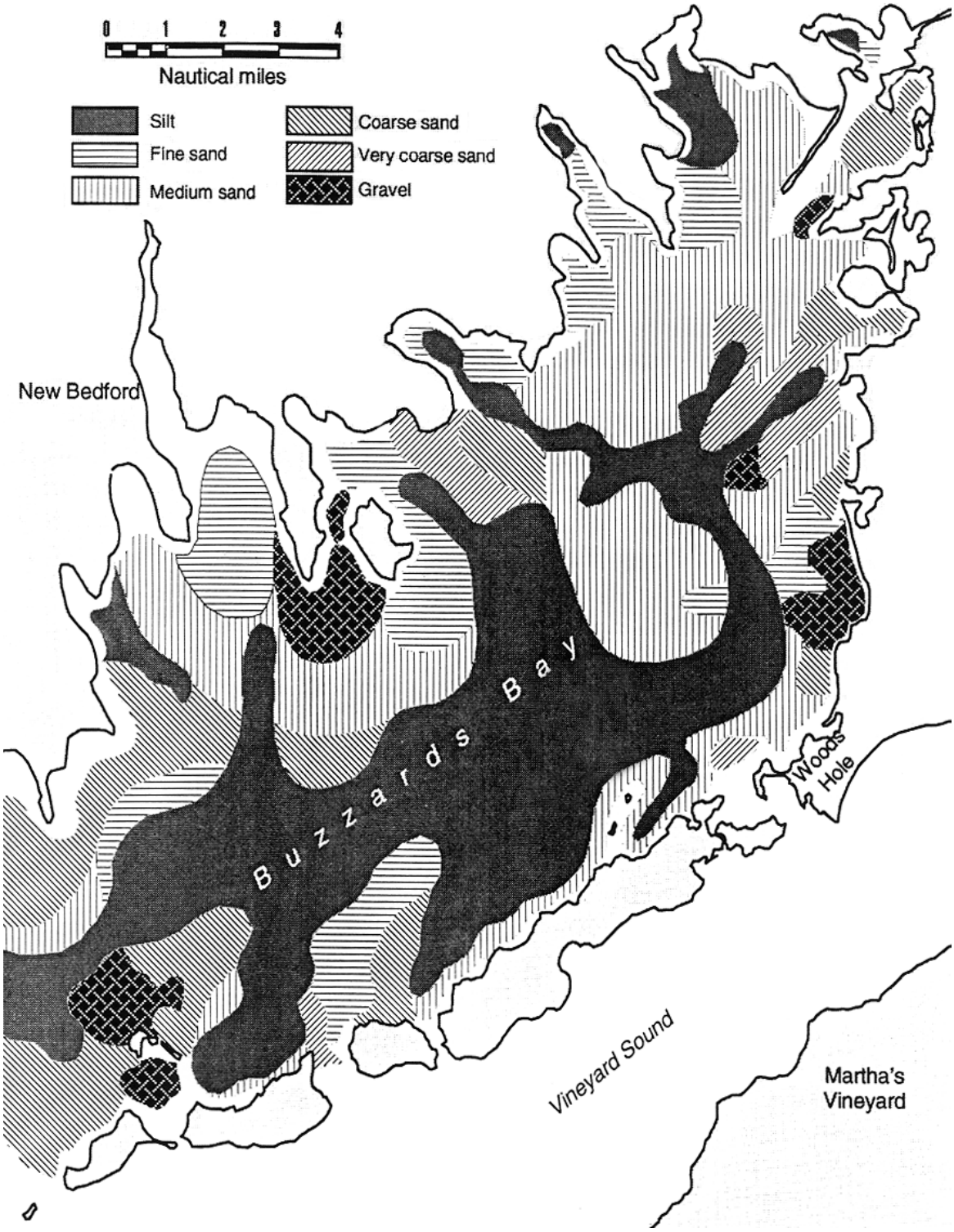


**Figure 3.** Map of sediment types in Buzzards Bay (from Moore 1963).

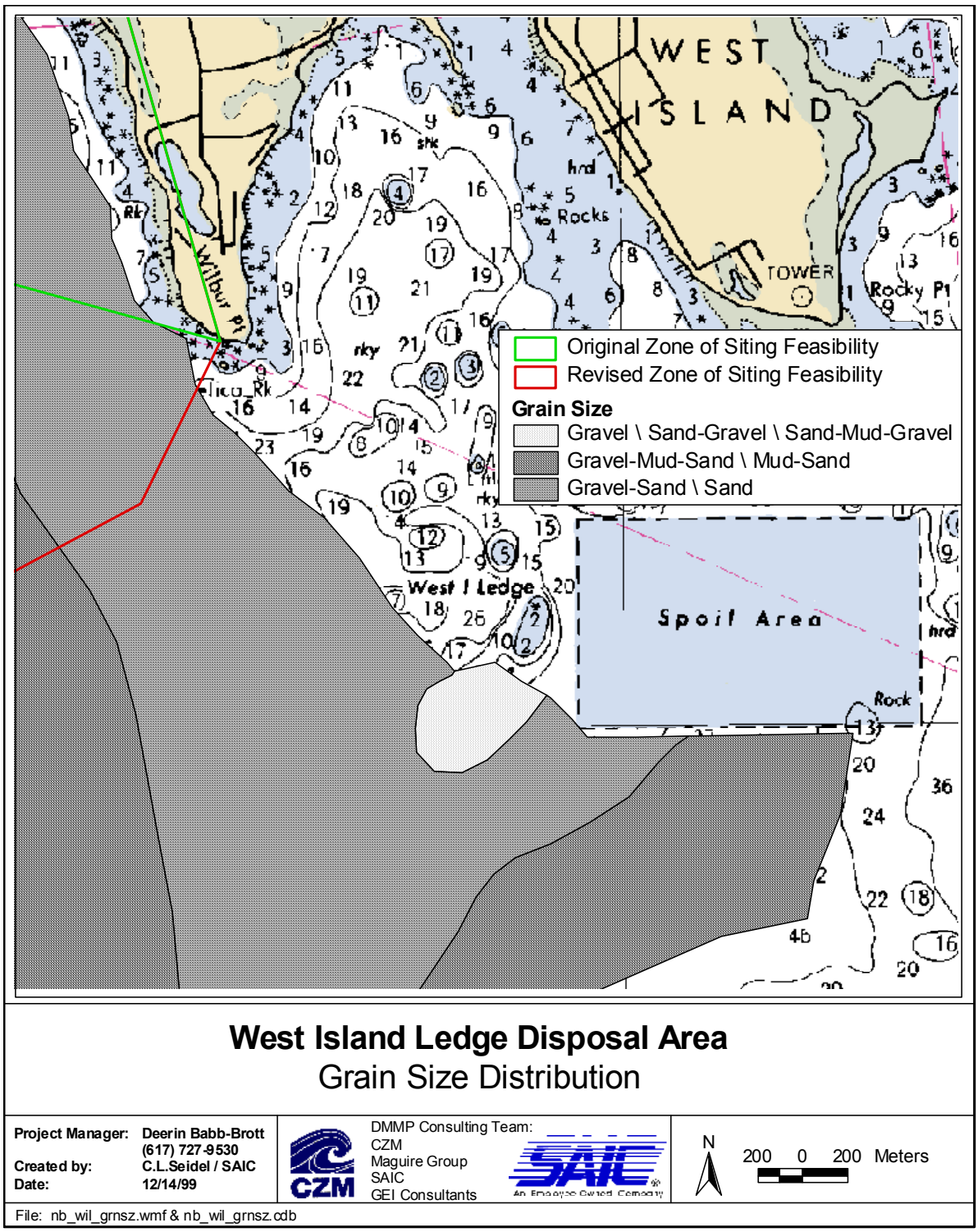


**Figure 4.** Map of sediment grain size in the vicinity of the historic West Island Ledge disposal site (from Summerhayes et al. 1985).

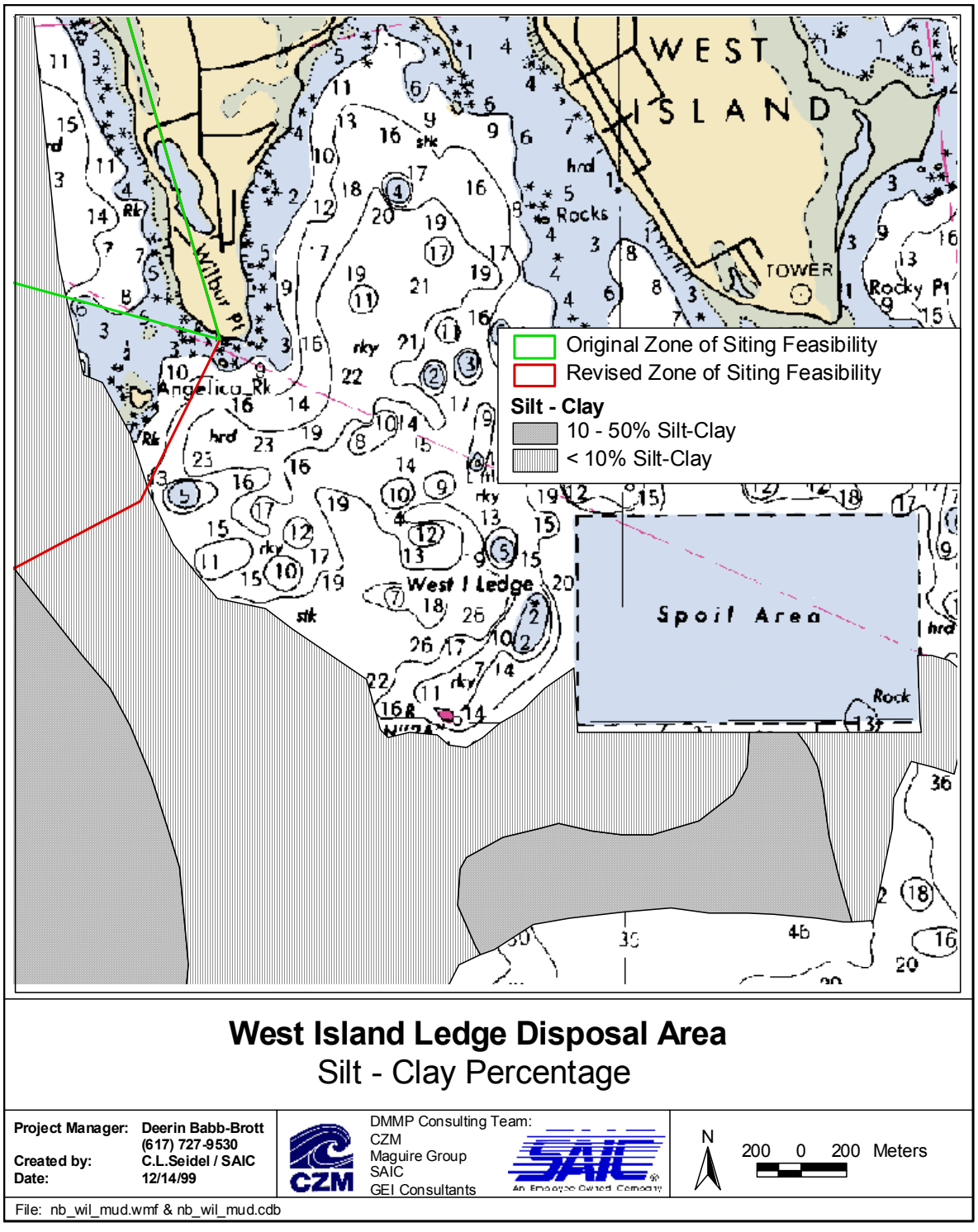


**Figure 5.** Map showing the percentage of silt-clay in surface sediments in the vicinity of historic West Island Ledge disposal site (from Summerhayes et al. 1985).

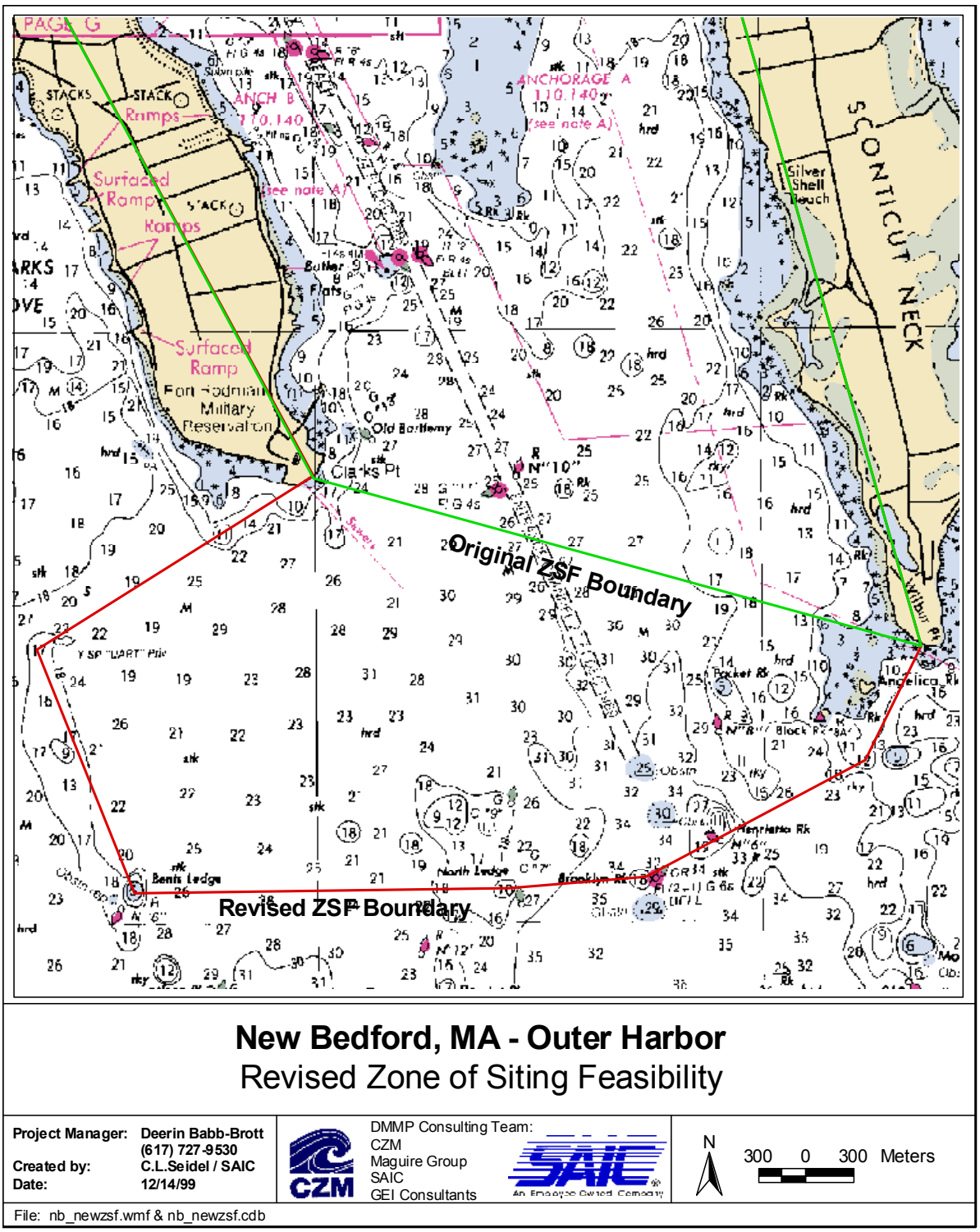


**Figure 6.** Map showing depth (in feet) and bottom topography in the Outer Channel Area.

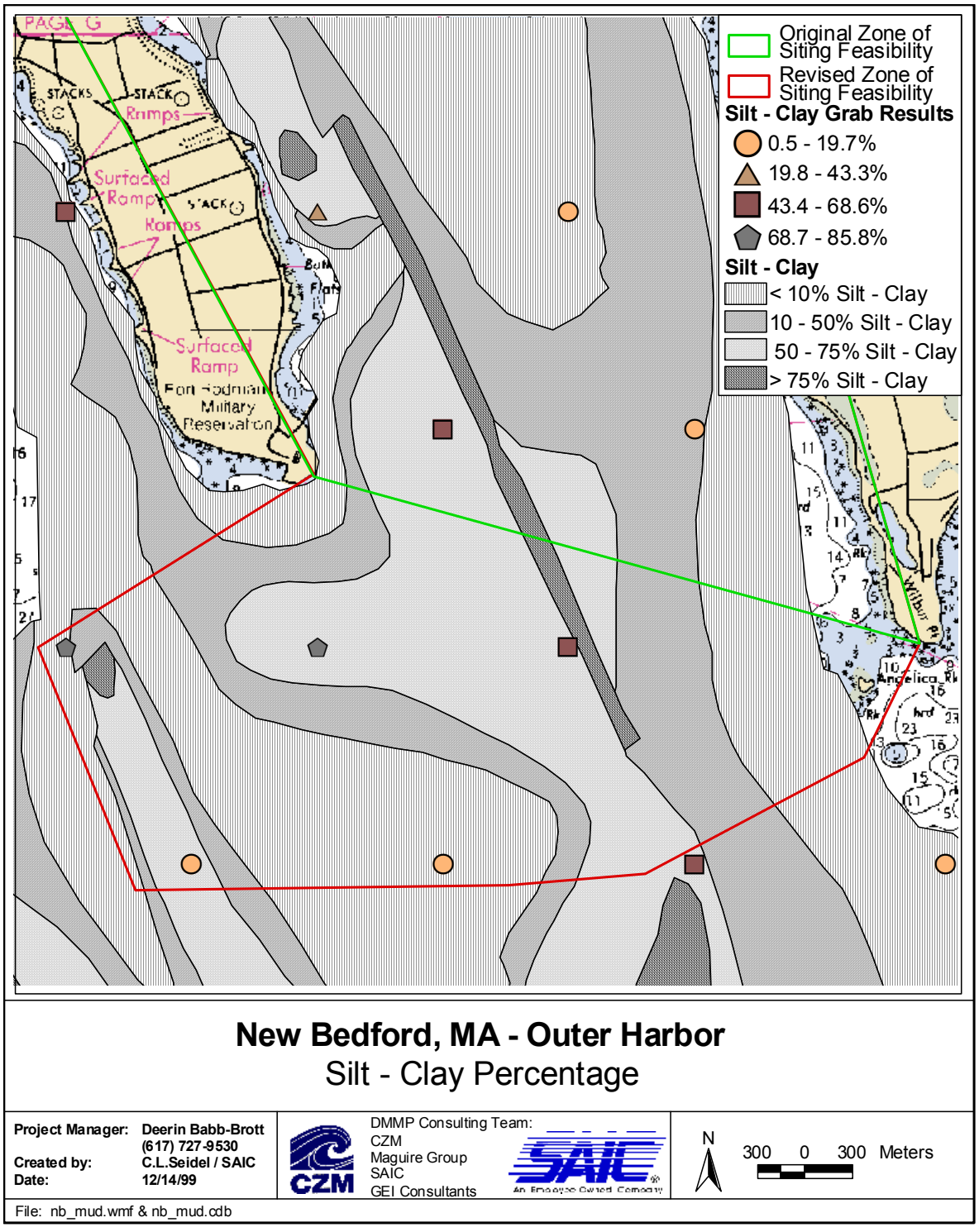


**Figure 7.** Map showing the percentage of silt-clay in surface sediments in the Outer Channel Area. The contoured results are from Summerhayes et al. (1985). The point data ("silt-clay grab results") are from Nelson et al. (1996).

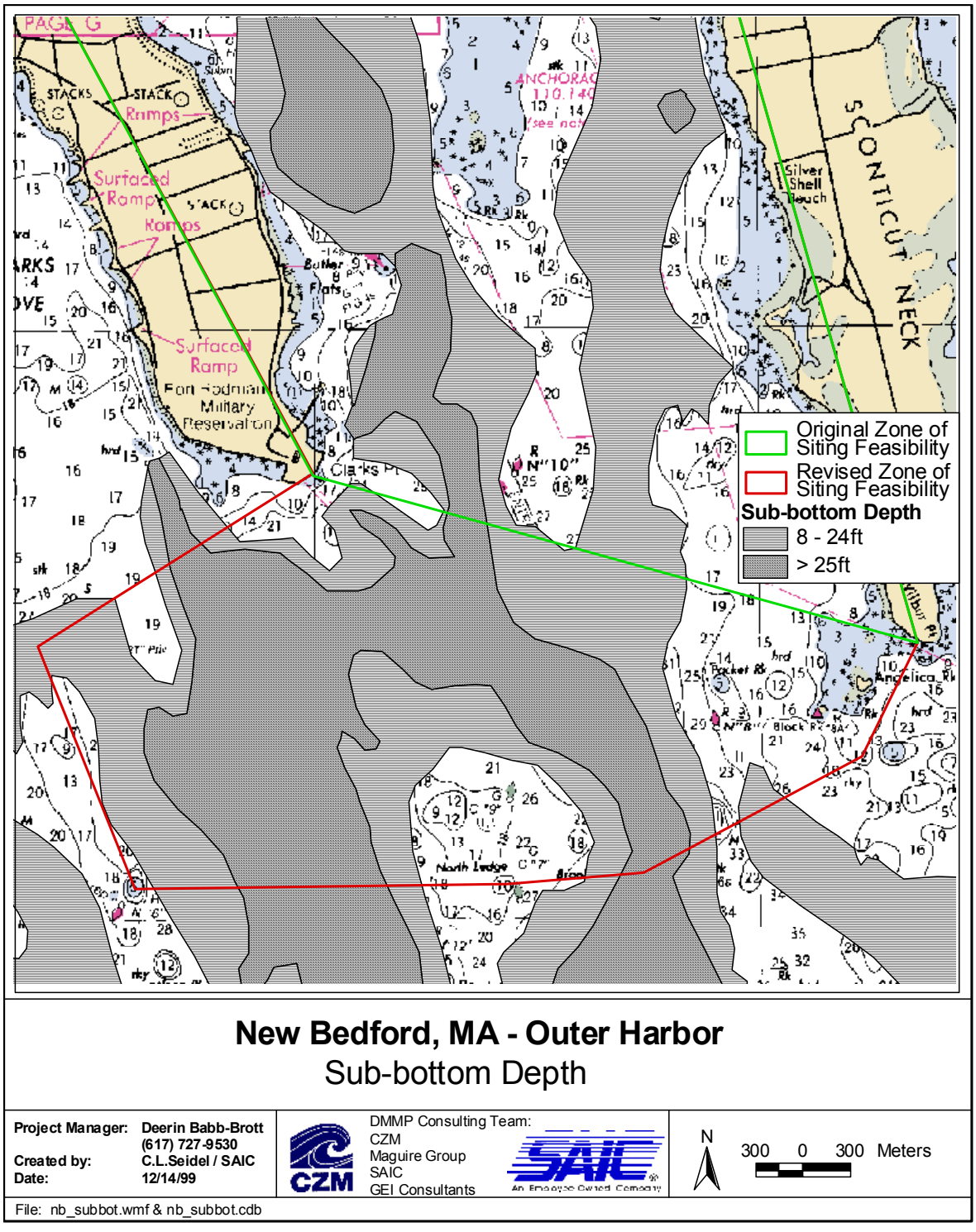


**Figure 8.** Map showing depth to bedrock ("sub-bottom depth") in the Outer Channel Area (from Summerhayes et al. 1977; 1985).

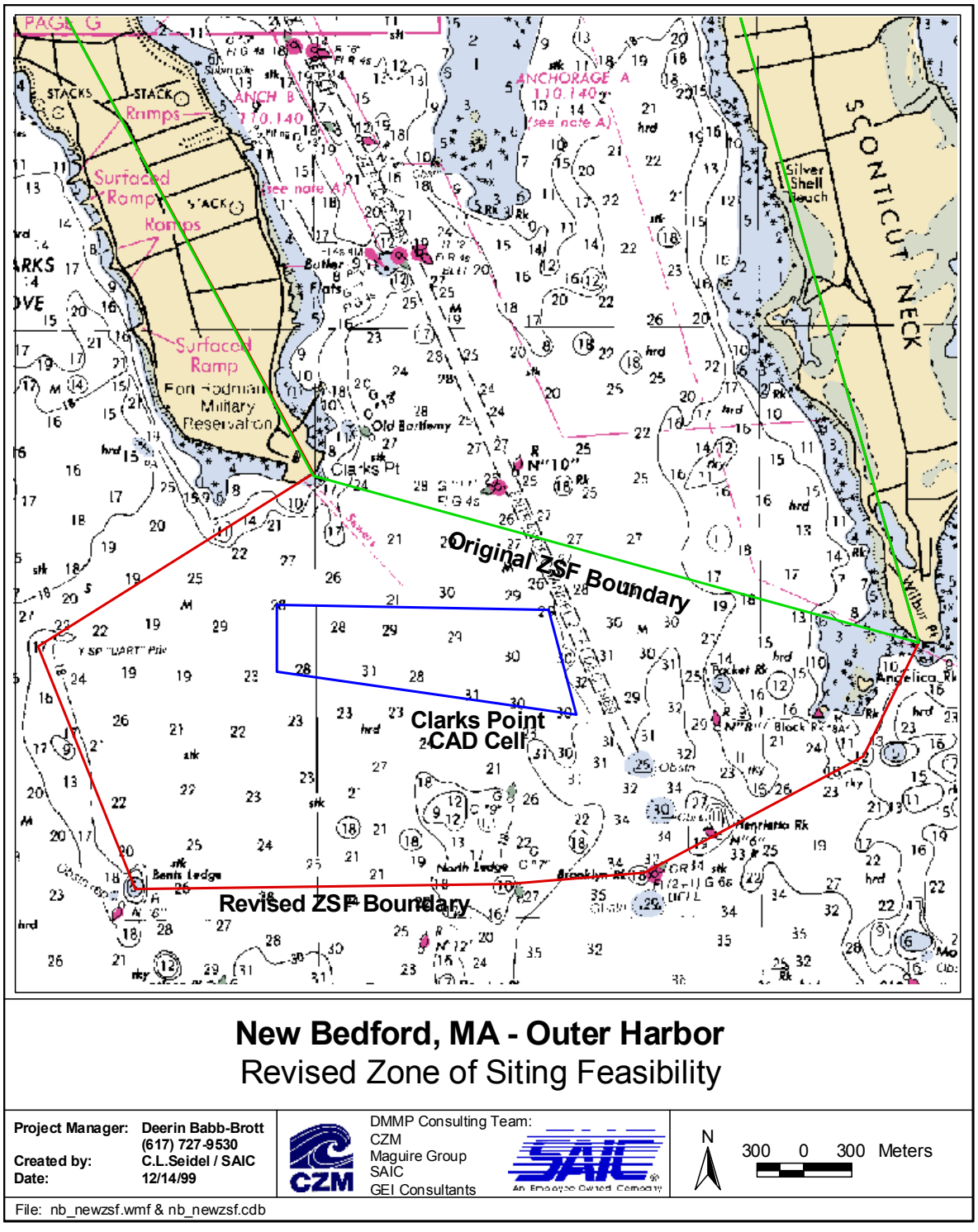


**Figure 9.** Map showing the location of the candidate Clarks Point CAD site located in the Outer Channel Area to the west of the shipping channel.

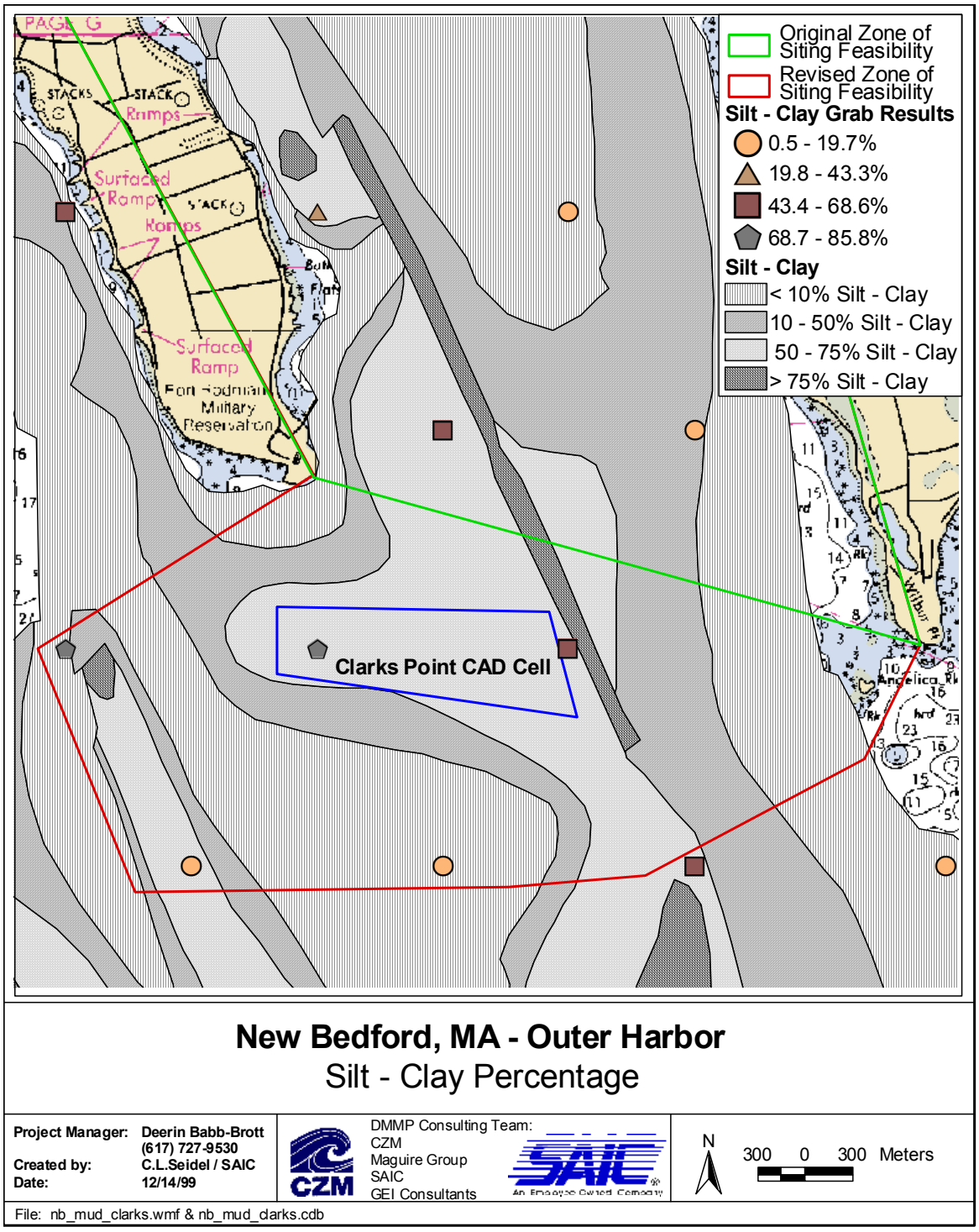


**Figure 10.** Map showing the configuration of the Clarks Point CAD site in relation to the silt-clay content of surface sediments.

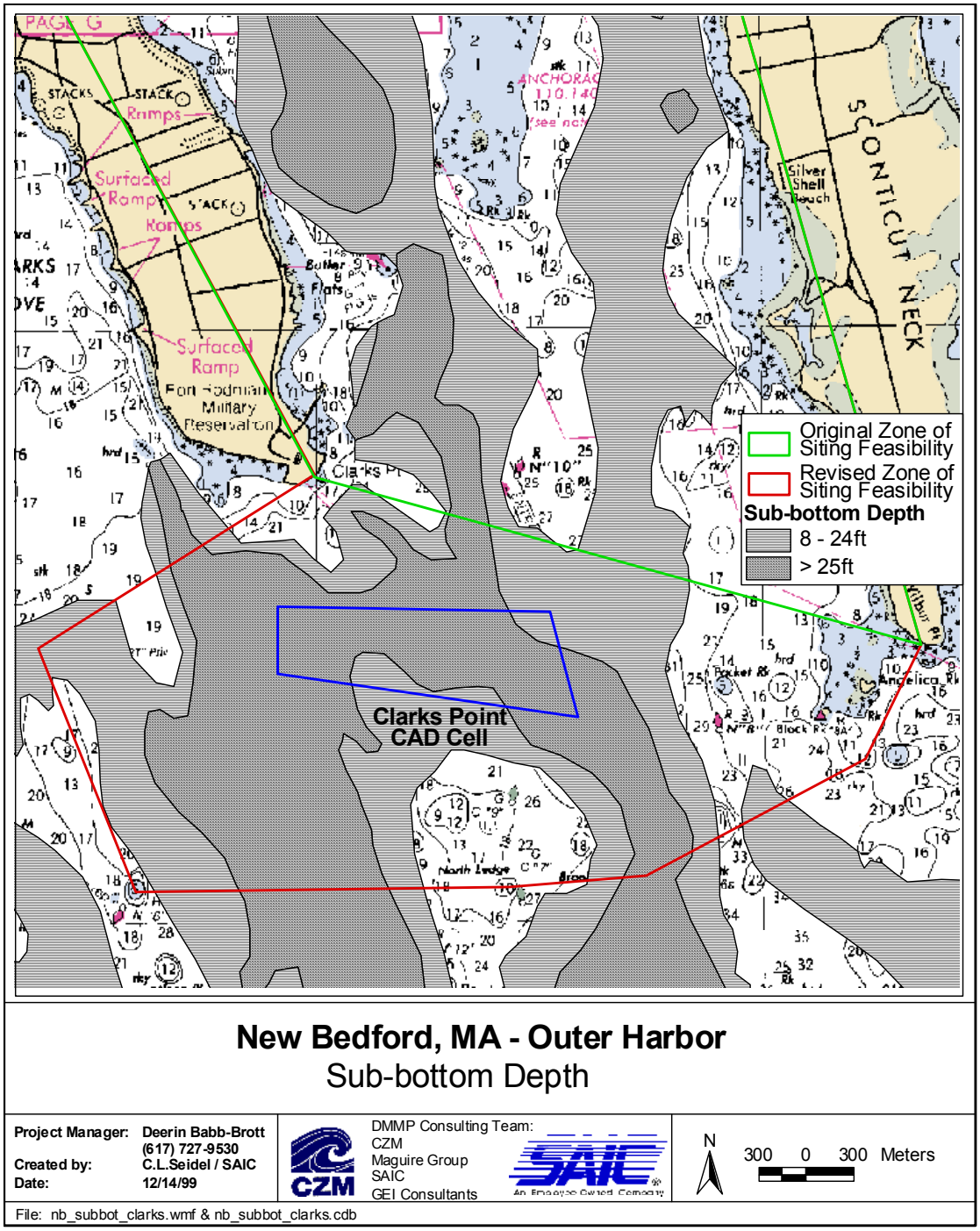


**Figure 11. Map showing the configuration of the Clarks Point CAD site in relation to sub-bottom depth.**